performing data staging at predetermined time

intervals; and

updating the calling profile cube by generating a

snapshot cube from a call table; and

merging the snapshot cube with the calling profile

cube to generate an updated calling profile cube.

24. The method of claim 28 wherein the calling profile

cube has a cell that includes a probability distribution

value based on one of the probability distribution on

calls to each callee and the probability distribution on

all calls.

25. The method of claim 22 wherein the dimensions include

a day-of-week hierarchy, a time hierarchy, and a duration

hierarchy.

Please add the following new claims:

--27.   (New)   A   method   for   detecting

telecommunication fraud performed in a data processing

system having a data warehouse and an OLAP server, the

method comprising:

retrieving a plurality of call records from the data

warehouse;

generating a calling profile cube based on the call

records; wherein the calling profile cube

includes information on multiple customers;

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retrieving records from the profile table and based

thereon generating a profile cube representing

the records from the profile table, said profile

-cube having predetermined dimensions that are

the same as the dimensions of the snapshot cube;

merging the snapshot cube and the profile cube to

generate an updated profile cube; and

deriving the volume-based calling pattern cubes based

on the updated profile cube.

3.   A method as in claim 27 wherein the step of when the
volume-based   calling   pattern   cube   is   in   a   first
predetermined relationship with predetermined fraudulent
volume-based calling pattern, performing a first action
includes one of:

flagging a particular caller with the volume-based

calling pattern being analyzed as suspicious;

automatically generating an alert that specifies

callers with suspicious volume-based calling

pattern;

performing further investigation on callers with

suspicious volume-based calling pattern;

cancellation of telephone services for callers with

suspicious volume-based calling pattern; and

performing other appropriate remedial actions.

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4. A method as in claim 1 further comprising:

analyzing the calling pattern cube by utilizing at

least one OLAP operation.

6. A method as in claim 27 wherein the predetermined

fraudulent volume-based calling pattern in one of a

personalized calling pattern and a group-based pattern.

7. A method as in claim 2 further comprising:

storing the updated profile cube into the profile

table in the data warehouse; and

performing data staging between the profile table and

the updated profile cube at predetermined time

intervals.

a 2

8. A method as in claim 2 wherein said profile cube,

snapshot cube, and updated profile cube each includes

at least two dimensions and at least two levels.

9. A method as in claim 8 further comprising:

analyzing the calling pattern cube by utilizing at

least one OLAP operation along more than one

level.

10. A method as in claim 8 further comprising:

analyzing the calling pattern cube by utilizing at

least one OLAP operation along more than one

dimension.

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11. A method as in claim 2 wherein the profile cube, snapshot cube, and the updated profile cube each are multi-level and multi-dimensional cubes.

12. A method as in claim 2 wherein the profile table and the call table each has a plurality of attributes, and the profile cube and snapshot cube each has a plurality of dimensions, said attributes corresponding in a one-to-one fashion to the dimensions.

13. A method as in claim 2 wherein the profile cube includes at least one cell having probability based values.

14. A data processing system comprising:
   a data warehouse for storing data in a relational format, said data warehouse including a profile table and a call table;
   an OLAP server, coupled to the data warehouse, for providing predetermined OLAP operations; and
   a profile engine, coupled to the data warehouse for computing, maintaining and utilizing caller pattern cubes that represent caller profiles; wherein the caller pattern cubes can be utilized to detect telecommunication fraud.

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15. A data processing system as in claim 14 further comprising:

a fraud detection module for detecting telecommunication fraud by comparing known fraudulent profiles to caller pattern cubes;

the profile engine further generating a profile cube from information selected from the profile table, generating a snapshot cube, updating the profile cube by merging the profile cube and the snapshot cube to generate an updated profile cube, and deriving a calling pattern cube based on the updated profile cube; wherein the profile engine is a scalable computation engine that is implemented by OLAP programming supported by the OLAP server.

16. A data processing system as in claim 14 further comprising:

an analysis tool for use by a data analyst to perform one of comparing the calling pattern cube to known fraudulent calling pattern cube and extracting information from the calling pattern cube based on selected dimensions, levels, and ad-hoc queries provided by the data analyst.

17. A data processing system as in claim 14 further comprising:

a visualization tool for use by a data analyst to

display the calling pattern cube in different

formats, levels, and dimensions.

18.   A data processing system as in claim 14 further
comprising:

a data staging tool for transferring data between the

profile cube stored in the OLAP server and

profile table in the data warehouse at

predetermined time intervals.

20.   A method as in claim 1 further comprising:

utilizing an OLAP server to create a calling profile

cube, updated calling profile cubes, derive

calling pattern cubes from the calling profile

cube, analyzing calling pattern cubes, and

comparing calling pattern cubes;

wherein OLAP programming supported by the OLAP server

provides a scalable computation engine for

generating and processing the calling pattern

cubes.

22.   The method of claim 28 wherein the calling profile
cube is a multi-dimensional and a multi-level cube and
wherein the volume-based calling pattern cubes are multi-
dimensional and a multi-level cubes.

23.   The method of claim 28 further comprising:

generating a volume-based calling pattern cube for

each individual customer based on the multi-

customer calling profile cube;

comparing the volume-based calling pattern cube for

each customer to a predetermined fraudulent

volume-based calling pattern; and

when the volume-based calling pattern cube is in a

first predetermined relationship with

predetermined fraudulent volume-based calling

pattern, performing a first action.

28.   (New)   A method for detecting telecommunication

fraud performed in a data processing system having a data

warehouse and an OLAP server, the method comprising:

retrieving a plurality of call records from the data

warehouse;

generating a calling profile cube based on the call

records; wherein the calling profile cube

includes information on multiple customers;

generating a volume-based calling pattern cube for

each individual customer based on the multi-

customer calling profile cube;

generating a probability-based calling pattern cube

based on the volume-based calling pattern cube

for each individual customer;

comparing the probability-based calling pattern cube

for each customer to a predetermined fraudulent

probability-based calling pattern;

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when the probability-based calling pattern cube is in

a first predetermined relationship with

predetermined fraudulent probability-based

calling pattern, performing a first action.

29. A method as in claim 28 wherein the step of when the probability-based calling pattern cube is in a first predetermined relationship with predetermined fraudulent probability-based calling pattern, performing a first action includes one of:

flagging a particular caller with the probability-based calling pattern being analyzed as suspicious;

automatically generating an alert that specifies callers with suspicious probability-based calling pattern;

performing further investigation on callers with suspicious probability-based calling pattern;

cancellation of telephone services for callers with suspicious probability-based calling pattern; and

performing other appropriate remedial actions.

30. (New) The method of claim 29 wherein the probability-based calling patterns enables one of the analysis and comparison of a first probability-based calling patterns that covers a first time period with a